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Improve Your Health by Optimizing Your Circadian Rhythm

Analysis by Dr. Joseph Mercola | September 15, 2024

STORY AT-A-GLANCE

- Nearly every cell in your body has its own circadian clock, which regulates the activation and deactivation of genes
- To optimize your health, it's important to pay attention to and honor ancient patterns of waking, sleeping and eating
- Sleeping less than six hours a night dramatically increases your risk of insulin resistance, which is at the core of most chronic diseases
- Meal timing has a significant impact on your circadian rhythm. Many organs need between 12 and 16 hours of rest, meaning a minimum of 12 hours without food, to allow for repair
- By optimizing your circadian rhythm, you're going to optimize your NAD production and vice versa

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Satchidananda Panda, Ph.D., is a leading researcher in a very important field of study — the circadian rhythm, which is the topic of his book, "**The Circadian Code: Lose Weight, Supercharge Your Energy, and Transform Your Health from Morning to Midnight**." It's a great read, written at a level that is easy to understand.

Growing up on a farm in India, he was initially intrigued by the fact that he slept best during the summertime. Then, going through agricultural school, he realized that

different plants flower at certain times of the day.

> *"A few years later, when I was thinking about grad school, I realized there are so many things about biology of time,"* Panda says. *"Every biological system depends on time; just like throughout the day we have a clear timetable when we should be doing this and that — meeting people and having conversation and having dinner.*
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> *Every organism has that [but] we haven't learned the biology of time. That's why I got excited about circadian rhythms, because this is a universal timing system, starting from pond scum to humans … Every organism has to go through this 24-hour timing schedule.*
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> *If this is disrupted, then plants will flower at the wrong time and animals will not reproduce well. In humans, lots of different diseases can happen. That's why I got excited about circadian rhythms and got into my Ph.D. Now I'm at the Salk Institute, a nonprofit research organization in San Diego, California."*

Circadian Rhythms Are Under Genetic Control

In 2017, the Nobel Prize in Physiology or Medicine was awarded to three U.S. biologists — Jeffrey Hall, Michael Rosbash and Michael Young — for their discovery of master genes that control your body's circadian rhythms.[1,2,3,4,5] Panda explains:

> *"The bottom line is almost every cell in our body has its own clock. In every cell, the clock regulates a different set of genes, [telling them] when to turn on and [when to] turn off.*
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> *As a result, almost every hormone in your body, every brain chemical, every digestive juice and every organ that you can think of, its core function rises and falls at certain times of the day [in a coordinated fashion].*
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> *For example, your growth hormone might rise in the middle of the night, in the middle of sleep. At the same time, if there is not [too much] food in your*

stomach, then the stomach lining will start to repair. For that repair to work perfectly, the growth hormone from the brain has to coincide with the stomach repair time.

In that way, different rhythms in different parts of our body have to work together for the entire body to work optimally. In fact, to have these daily rhythms and sleep-wake cycle, being more alert in the morning, having the bowel movement at the right time, having better muscle tone in the afternoon, these rhythms are the fountain of health. That's the indication of health."

Shift Work Disrupts Your Circadian Rhythm

The idea that you could micromanage this intricately timed system from the outside is foolish in the extreme. As Panda notes in his book, the key, really, is to pay attention to and honor ancient patterns of waking, sleeping and eating.[6] By doing that, your body more or less takes care of itself automatically.

"Yes, to leverage these daily rhythms that are so ingrained in our body, we just have to do a few things: sleep at the right time, eat at the right time, and get a little bit of bright light during the daytime. That's the foundation. We can do very simple things to reap the benefits of the circadian rhythm and the wisdom of our body," Panda says.

One of the most common circadian anomalies in today's modern world is shift work. If you're like me, you might be under the misconception that it's a relatively small minority of people that engage in this activity, but Panda cites research showing a full 20% to 25% of the American nonmilitary workforce disrupt their natural circadian rhythm by working nights.

In his book, shift work is defined as any work that requires you to stay awake for three hours or more between 10 p.m. and 5 a.m. for more than 50 days a year (basically once a week).

The fact that 1 in 4 is exposed to this circadian rhythm aberration is bad enough, but on top of that there are the health effects of dirty electricity and the unhealthy light spectrum emitted by pulsing light-emitting diodes (LED) and fluorescent lighting, which further exacerbates the problem.

> *"Only in the last 16 years we have come to understand the impact of light on our health,"* Panda says. *"Before this, we thought that lighting is only for vision. Our eyes just have retinal cone cells to guide us throughout the world. Sixteen years ago, myself and two others … discovered this blue light-sensing light receptor called melanopsin.*
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> *These light-sensing cells in the retina — 5,000 of them per eye — are hardwired to many parts of the brain, including the master clock in the hypothalamus, and the pineal gland that makes … melatonin.*
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> *That discovery completely changed how we look at light. It's not only lighting for safety or security. We have to now think about lighting for health … We [also] have to now think about blue light.*
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> *It's not that we should get rid of blue light completely. We need more blue light during the daytime, and we need less at least three to four hours before going to bed.*
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> *The bottom line is in the last 100 to 150 years, we have cleared the man-made world without paying attention to circadian rhythms. Now we have the excellent opportunity to recreate and rebuild this entire world that will optimize our health."*

The Price You Pay for Chronic Sleep Disruption

It's extremely difficult to estimate the price paid for widespread sleep disruption, but what is known is what happens when you chronically disrupt your circadian rhythm. Panda explains:

"Starting from babies all the way to 100-year-olds, we know that a few nights of staying awake for three to four hours or even eating at the wrong time can cause irritation, foggy brain, mild anxiety, loss of productivity and insomnia.

At the same time, this can flare up underlying autoimmune disease … We can look at shift workers in controlled clinical studies. When we make a list of diseases that circadian rhythm disruption contributes to, it's a huge list.

It goes from mental health issues such as depression, anxiety, bipolar disease, attention-deficit hyperactivity disorder, autism spectrum disorder and post-traumatic stress disorder [to] obesity, diabetes, cardiovascular disease and fatty liver disease …

Many of these affect more than 10% of the population. And then you bring in gastrointestinal diseases: irritable bowel syndrome, irritable bowel disease, and even heartburn and ulcerative colitis.

If you combine all of these, then we can see clearly why nearly one-third of all adults in the U.S. have one or more of these chronic diseases, more than two-thirds of adults at the age of 45 have some of these chronic diseases. Nine out of 10 at the age of 65 have two or more of these chronic diseases.

Now, the question is, 'How much of this is due to circadian rhythm disruption and other factors, or maybe circadian rhythm disruption with underlying genetic cause?' We cannot come up with a clear figure, but it's very clear that if we optimize circadian rhythm, we can really move the needle."

Sleep Deprivation Induces Glucose Intolerance

Research by Eve Van Cauter, director of the Sleep, Metabolism and Health Center at the University of Chicago, also shows that sleeping less than six hours a night dramatically increases your risk of insulin resistance, which is at the core of most chronic diseases, including those mentioned above. There's actually a daily rhythm in insulin sensitivity.

For example, if you do a glucose tolerance test in the morning, it may be normal, but done in the evening, it may suggest you have prediabetes. She also showed that when otherwise healthy people are deprived of sleep and allowed to sleep only five hours or less per night, they develop glucose intolerance in as little as four days. As noted by Panda:

> *"That's really eye-opening. Because many of us go through that kind of disruption on a monthly or weekly basis. Shift workers go through that half of their life. That might explain the rise in glucose intolerance and having 85 million prediabetics in [the U.S.]."*

Melatonin Production and Sleep Disorders

In his book, Panda discusses how melatonin production changes with age. With increasing age, melatonin production starts going down such that a 60-year-old produces one-tenth the melatonin of a 10-year-old. As noted by Panda, reduced melatonin production is at the heart of many sleep disorders seen in the elderly.

So, how can you optimize your melatonin production as you age? One common solution is to take a melatonin supplement. Melatonin receptor agonist drugs are also available. However, a simpler solution that anyone can do, which costs nothing, is to control your lighting.

> *"Just imagine, 150 years ago, the firelight, the lamplight or even the full moon light was only 1 to 5 lux. Full moon light is maximum 1 lux. Now, we have 50 to 100 lux. In some department stores you can get 600 to 700 lux of light in the evening. That's a tremendously high amount of light. That would slam your melatonin [production] down to almost zero,"* Panda says.

Ideally, replace LEDs and fluorescent light bulbs in key areas where you spend time in the evening with low-watt incandescent bulbs, and avoid electronic screens for a few hours before bedtime.

An alternative is to wear blue-filtering eyeglasses at night. Just make sure not to wear them during daytime. Also, make sure the glasses filter out light between 460 and 490 nanometers (nm), which is the range of blue light that most effectively reduces melatonin. If they filter everything below 500 nm, you should be good to go.

The Importance of Meal Timing

Panda has also investigated the impact of meal timing on circadian rhythm. Just like many cleanout functions occur in your brain during deep sleep, all other organs also need downtime. Many organs actually need between 12 and 16 hours of rest, meaning a minimum of 12 hours without food, to allow for repair.

In time-restricted feeding trials, Panda has shown that mice whose feedings are restricted to a window of eight to 12 hours are protected from obesity, diabetes, cardiovascular disease, systemic inflammation, high cholesterol and a host of other diseases. This, despite the fact they're eating the same amount of calories and the same type of food as animals allowed to graze throughout the day and night.

More importantly, when fat mice are placed on an eight- to 10-hour time-restricted feeding schedule, many of these diseases can be reversed. Human trials suggest the same results can be obtained in humans who adopt a time-restricted eating schedule where all food is eaten within a window of eight to 10 hours.

According to Panda, at bare minimum, you should fast for 12 hours a day — that's eight hours of sleep, plus three hours of fasting before bed, plus another hour in the morning, to allow your melatonin to level off. At 12 hours of fasting per day, you will maintain your health, but you're unlikely to actually reverse disease. For that, you need to fast longer.

> *"The question is how short one can go. This is where there is some limitation in doing controlled studies like we do on animals, where we can do this for a long period of time, because if you reduce access to food for less than six hours in many animals, they will reduce their caloric intake.*

So, then we cannot figure out whether the benefit or harm we are seeing is due to the reduction in calories or reduction in timing," Panda says.

"The way I look at it, 12-hour time-restricted eating is something everybody should do. It's like brushing your teeth every day. What is surprising is only 10% of the population consistently eat within 12 hours … [Then] once every six months or once a year, [go down to] eight-hour eating for a month or so."

There's an App for That

Panda has developed a very helpful free app, available on Android and iOS, called **myCircadianClock**. By using this app, you will contribute to Panda's circadian research.

"We ask people to self-monitor themselves for two weeks, because we know their weekdays and weekends might be different. We just want to get a broader picture of what is your lifestyle from one day to another. And then after two weeks, people can self-select whether they want to eat all their food within 10 hours, 12 hours or eight hours.

You're free to do whatever you want to do … Over a long period of time, we can figure out what is good or bad for people. In this new app, you can log your food. It also has other bells and whistles. The app can be paired with your Google Health or Apple Health Kit. It can extract your step count, sleep, et cetera. …

After 12 weeks, we also want you to enter your body weight. If you have been collecting lots of other health data, then it's good to enter that. That's how it will help to figure out, at the epidemiological level, in real life situations, what our habits are and how we can change it.

The same app is being used in many controlled clinical studies. There are nearly 10 different studies going on in different parts of the world that use the same app … In that way, we can benefit from a controlled study as we launch this large open-to-all kind of studies."

According to Panda, most people will notice improvements in their sleep within two to three weeks of time-restricted eating. Symptoms of heartburn will also typically begin to resolve. Between weeks four and six, daytime energy levels typically increase while evening hunger pangs are reduced.

Between six and 12 weeks, people with prediabetes or diabetes will begin to see improvements in fasting blood glucose. Those with mild hypertension also tend to notice improvements at this time, as do those with irritable bowel syndrome, as the microbiome improves and the gut begins to repair.

> *"Once the gut repair improves, then systemic inflammation goes down. Between eight to 12 weeks, that's when a lot of people report that their joint pain goes down, because that's a good sign of inflammation.*
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> *Once in a while, we get random reports. For example, some people who have inflammatory disease or autoimmune disease, they sometimes say the severity has gone down,"* Panda says.

However, once you regain your metabolic flexibility and are no longer insulin-resistant, which takes a few weeks to a few months, it's important to increase your eating window again. This is because extended fasting raises your cortisol levels, which contributes to inflammation and cellular damage.

Vary your eating window between eight and 12 hours and avoid going lower or higher than that window. It is also best to avoid eating before sunrise or after sunset and at least three hours before bedtime.

On NAD and Circadian Rhythm

Nicotinamide adenine dinucleotide (NAD+) — one of the most important metabolic coenzymes in your body that helps redox balance and energy metabolism — is primarily generated through a salvage pathway rather than de novo or building NAD+ from scratch pathway.

The rate-limiting enzyme is nicotinamide phosphoribosyltransferase (NAMPT), which is also under circadian control. When your circadian rhythm gets disrupted, it causes NAMPT impairment. NAMPT also helps set the circadian rhythm. In short, by optimizing your circadian rhythm, you're going to optimize your NAD production. Panda explains:

> *"Studies say it goes both ways, because NAD also affects sirtuins, and sirtuins integrate with circadian rhythm. Nicotinamide adenine dinucleotide phosphate (NADPH) ratio also affects your [circadian] clock and transcription factors bind to DNA.*
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> *The bottom line that we have seen with circadian rhythm is if the clock regulates something, then there is a reciprocal feedback regulation from that output into the clock. That's the best way you can clear the homeostatic system. It's the chicken and egg story."*

More Information

To learn more, be sure to pick up a copy of "**The Circadian Code: Lose Weight, Supercharge Your Energy, and Transform Your Health from Morning to Midnight**." Also consider downloading **myCircadianClock**. It's free of charge, and will help you track your circadian rhythm while simultaneously contributing to Panda's research.

Sources and References

- [1] CNN October 2, 2017
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